THE DEVELOPMENT OF INSTRUMENTS AND AIDS FOR THE BLIND AT THE NATIONAL RESEARCH COUNCIL

J. C. SWAIL

REPRINTED FROM "REHABILITATION IN CANADA"
ISSUE NO. 14. (1966)
PP. 7 - 10

N.R.C. 9252

The Development of Instruments and Aids for the Blind at the National Research Council

By J. C. Swail
Radio and Electrical Engineering Division,
National Research Council, Ottawa.

Jim Swail was born in Montreal. He lost his sight at the age of four in an auto accident. He received his early education at the School of the Montreal Association for the Blind and later attended a regular high school. He graduated from McGill University with a B.Sc. in 1946 and immediately joined the staff of the Radio and Electrical Engineering Division of the National Research Council where he now works.

Mr. Swail is a director of the Montreal Association for the Blind and has assisted in the re-organization of their school and their social service program. He also serves on a committee of Canadian Universities and the Canadian National Institute for the Blind which is concerned with vocational counselling of blind university students.

As a group, the blind have traditionally been the most misunderstood and under-rated of the handicapped. This is probably due to the very high value placed on sight by society, and thus to the rather slow evolution of techniques that would enable the blind to replace this loss through the use of alternate methods, at least partially.

Until recently, blind persons were expected to restrict themselves to what has become known as the traditional crafts carried out in their homes or sheltered workshops, that is, the making of brooms, mops, baskets, the caning of chairs, and similar work.

Over the years many devices have been devised which could be useful in aiding the blind to find employment, but unless a reasonably large demand developed, such equipment was seldom made available. Because many of the various professional and technical jobs in which blind persons sought work were limited to a very few blind applicants, the fact has been that the instruments and aids which they required have not been obtainable.

In 1962 the American Foundation for the Blind sponsored the International Congress on Technology and Blindness in New York. At this meeting a number of organizations, including the National Research Council, displayed a wide range of specialized aids for the blind. Many of these had been developed to meet a specific requirement, quite often that of the designer himself, and thus many of the instruments were unique. Although considerable interest was shown in these instruments, there seemed little hope that copies would ever be made available.

With this problem in mind, a meeting was held in the summer of 1964 under the chairmanship of Professor T. A. Benham of Haverford College. The result was that Science for the Blind, an organization headed by the chairman, undertook to raise funds for a trial distribution of some of these specialized devices to determine their true value as an aid to employment of the blind. As it has turned out, most of the instruments so far distributed under this program are

Toledo scale employing photoelectric pointer location and Braille scale. This is at present in use at the Montreal Association for the Blind workshop. Reading accuracy is 0.5 oz. in a range of 40 lbs.

those developed at the National Research Council, and below is a brief description of some of these. Considering the very limited size of the project thus far, the results have been extremely encouraging and many new jobs have been opened up to the blind or made easier. It is hoped that in the near future a much expanded program will be possible.

Many blind persons have found employment developing film in photographic dark rooms. The one barrier in this work has been the lack of a suitable precision thermometer for monitoring the temperature of the developing chemicals. We have designed an electronic thermometer having a raised scale and an audible output. A probe, attached to the instrument by a flexible cable, is placed in the developer solution and a pointer on the raised scale is moved until the audible tone disappears. This indicates that the instrument is balanced, and the user reads the temperature by touch from the scale. The accuracy obtainable is about a quarter of a degree or better.

By the use of the same general techniques, that is, a raised scale in conjunction with an audible tone, adaptations have been made for reading many types of electrical meters. Most electrical quantities such as voltage, current, resistance, capacitance, and so on, can now be measured. Because so many industrial and laboratory instruments depend on electric meters as their read-out device, these instruments have made available to the blind a wide variety of jobs. These jobs vary all the way from broadcast engineer in a radio station to assembly line inspector, and even, through the use of these devices to read the engine tune-up equipment, motor mechanic.

The tape recorder has become almost a necessity to the blind student or professional as it provides a convenient means of storing informa-

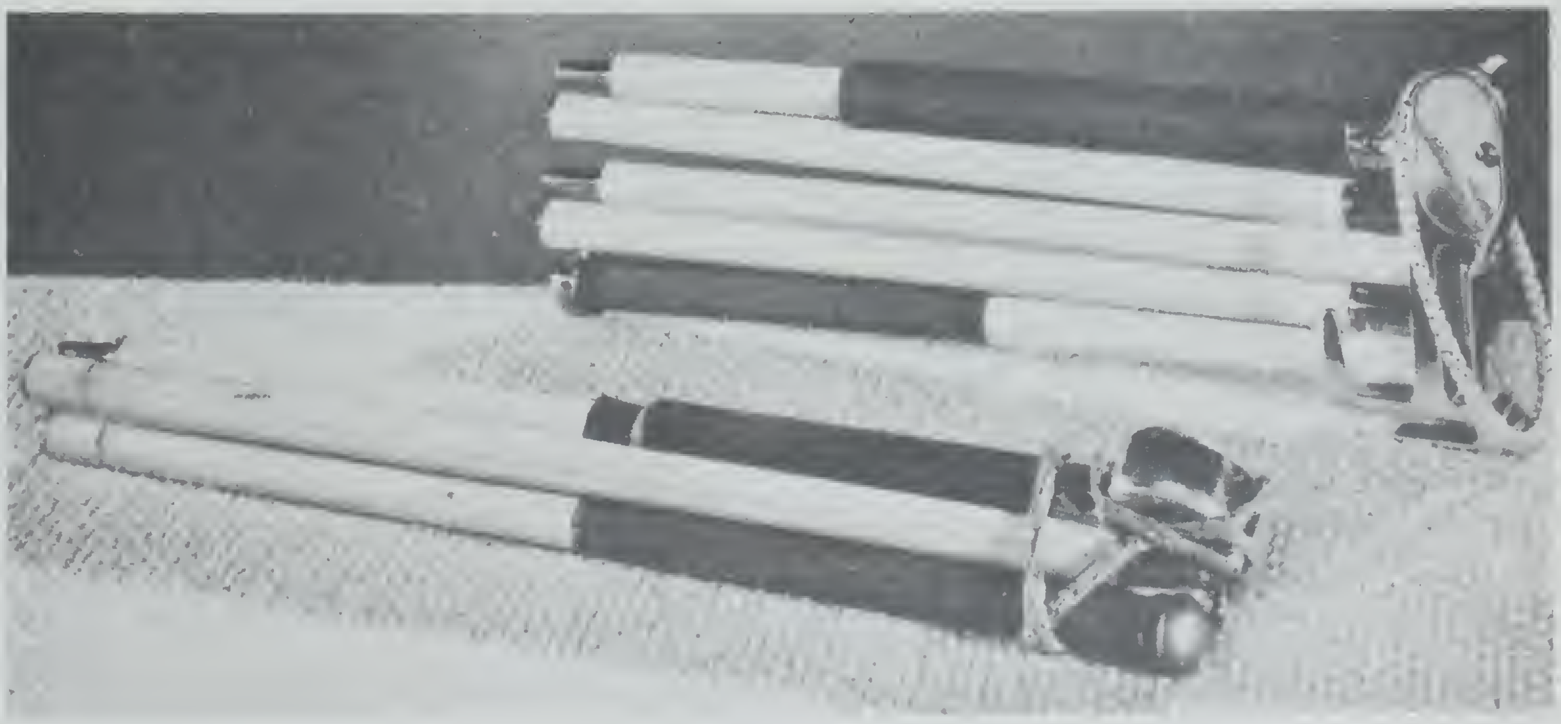
Simpson Model 260 volt-ohmilliameter modified for use by the blind.

tion, or of obtaining needed books read by volunteers. The two problems which confront a blind person in successfully using a recorder are: a means of reading the tape position indicator, a device for finding one's place on a tape, and a method of reading the recording level indicator which indicates the strength of the recording. Some years ago we designed a Braille tape position indicator, but recently the Royal National Institute for the Blind in the U.K. has started to market such a device and thus we stopped work in this area. We have designed a number of recording level indicators for a variety of purposes. These substitute an audible warning tone for the usual meter or magic eye indication. Some of these instruments are in use in professional recording studios and broadcast stations, while smaller types have been devised for the student using a portable recorder as a classroom notebook.

Recently we have developed a carpenter's or machinist's level. This instrument emits a tone which disappears when the unit is exactly level. The precision of this device is approximately two minutes of arc, one thirtieth of a degree.

Although not yet available, we are developing a new form of Braille sliderule, and an optical probe. The latter instrument is intended to permit a blind person to find the blank spaces on a printed form, to tell whether the lights in a room are on, and to do many other things.

Not all our efforts have been in the area of instrumentation. We have also been working on a number of projects related to the mobility of blind persons. Everyone is familiar with the blind person's white cane. Until recently this has usually been a conventional prosthetic cane appropriately painted, but during the second world war a new technique was evolved by a group working with blinded American veterans. This was based on the use of a much longer cane made from light aluminum alloy. With this new technique the cane is held well in front of the traveller so that it serves as an extension of his tactile system instead of as a shield held across the body, as had been the usual case with the prosthetic cane. This allows much more rapid and graceful mobility, but one disadvantage of the system has been the problem of where to store a 4-5-foot cane when entering an automobile or bus. To successfully fulfill its function as a tactile extension, the cane must be light and absolutely rigid. Many folding canes are available but all are either very fragile or display considerable looseness in the joints between sections. We have developed a folding cane which seems to overcome this difficulty. It is made of several sections of half-inch diameter dural tubing



Two versions of the folding cane.

The folding cane fully extended.

with precision ground stainless steel cones and sockets fitted into their ends. Small holes in the centre of these cones permit a nylon cable to run the full length of the cane, being attached firmly to the tip at the lower end, and being kept under a constant 3-lb. tension by a clock type spring in the handle. The handle serves not only as a housing for the spring, but as a clip to retain the sections in a flat pack when the cane is folded. A 4-ft. cane folds into a package about 11 x 3 x 0.5", weighing 11 ounces. It may be folded or unfolded in a matter of seconds. The cane is currently undergoing field trials to determine its usefulness and durability.

A radio compass has been designed around a small transistor radio to aid a blind traveller to cross a wide open area, such as the entrance to a parking lot, where the landmarks he normally uses are not available. This too is under evaluation study.

We have designed a number of auditory beacons to aid a blind person to find his way back to a point, again where other landmarks are not available. Such situations as being able to return to a predetermined point on a beach when swimming, or assisting in shovelling a straight path after a snowfall, are aided by these devices. The beacons, when put into operation, emit a short burst of tone every few seconds.

A more sophisticated version is silent until the user signals to it by blowing on an ultrasonic whistle, at which time it transmits a tone. This type of beacon is of use in a situation where a blind person may live in the centre of a long row of similar dwellings, with little to distinguish one from another. He could not leave a beacon sounding all day while he is away at work, but he could put one of this second type of beacon into operation in the morning. It will remain silent until his return at night, and when he approaches the proper area a short blast on his ultrasonic whistle will call forth a sound from the beacon at his doorway, thus identifying the correct entrance.

In the production of hand-drawn raised diagrams, dots are punched through the page with a punch or spur wheel. This means that, as the dots appear on the under side and must be turned over to be felt, the figure must be produced in reverse. This makes the production of such material much more difficult and imposes a severe limitation on their availability.

We have developed a special punch, the Dot Inverter, which is so designed that it first makes a dot on the reverse side of the page in the usual way, but when the punch is withdrawn it pulls the dot up and through the sheet so that it appears on the working side of the page. This eliminates the reversal, and greatly facilitates the making of raised mathematical drawings, maps, and so forth. Besides its obvious applications in the classroom, it is proving very useful in the teaching of mobility for illustrating building floor plans, local street maps, or a new route which may have to be used in getting to a new job. This last device is in production in the United States.